MEMORANDUM | January 25, 2016

TO Katherine Pease, NOAA

FROM Total Value Team

SUBJECT Technical Memo TM-11: Aggregate Estimate of Total Lost Value (Revised Draft)

11.1 INTRODUCTION

This memorandum presents the aggregate estimate of total economic loss suffered by U.S. households as a result of injuries to Natural Resource Trustees resources resulting from the release of oil into the Gulf of Mexico from the Macondo well in 2010.

The next section, 11.2, discusses the population for which damages are estimated and claimed. The population unit used is the household—that is, an individual who lives alone or a group of persons (typically, a family) sharing a residence.[1]

The following section, 11.3, discusses the use of the Lewbel-Watanabe (LW) estimator of the lower bound mean willingness to pay (WTP) and presents the estimates based on that approach for the two injury descriptions.

The final section, 11.4, presents the aggregate estimate of the monetary value of total economic loss.

11.2 DELINEATION OF THE POPULATION FOR AGGREGATION

Under the Oil Pollution Act (OPA), the Trustees can claim compensation for the economic losses experienced by the entire U. S. population.

However, for a variety of reasons, the Total Value (TV) study covers a somewhat smaller population of households. Cost considerations prevented the TV study from covering Alaska and Hawaii; in addition, access issues prevented coverage of American Indian reservations. In addition, the study was a household survey and did not cover the institutional or group quarters populations (such as persons living in nursing homes or on military bases). Finally, the survey was done only in English and thus covers households with at least one adult who spoke English well or very well. Consequently, household-level damages are extrapolated only to the eligible population.

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1 The Census Bureau defines a household as "all the persons who occupy a housing unit as their usual place of residence. A housing unit is a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. Separate living quarters are those in which the occupants live and eat separately from any other persons in the building and which have direct access from outside the building or through a common hall." See http://quickfacts.census.gov/qfd/meta/long_HSD310213.htm

11.2.1 CALCULATION OF THE SIZE OF THE ELIGIBLE POPULATION

The estimate of the total number of eligible households in the United States was based on data from the American Community Survey (ACS) 2013 1-Year Public Use Microdata Sample (PUMS) data.[2] The ACS is conducted by the U.S. Census Bureau and is the chief source of data on the U.S. population between the decennial censuses. The calculation of the size of the eligible population uses the PUMS data to mirror the eligibility exclusions in the survey. Namely, the eligible households were defined as those households:

- Residing in the lower 48 states or the District of Columbia only;
- Located outside of American Indian reservations; and,
- Including at least one member who is both 18 years of age or older and able to speak English at least "well," according to responses to the screening questionnaire.

Implicitly, this definition excludes persons who reside outside of households in group quarters or institutional settings. The U.S. Census Bureau provides ACS PUMS data in two data sets. The household-level data set contains the attributes and geography of each housing unit in the sample. Each housing unit observation has a unique serial number that can be linked to the person-level data set. The eligibility exclusions above require us to use information from both data sets.

First, the household data were limited to the lower 48 states and the District of Columbia, using the state field on each record.[3] Second, group quarters units were excluded using the housing weight variable, wgtp. The variable wgtp is equal to 0 for group quarters observations; these observations were dropped.

The remaining housing unit observations were then combined with the person-level data set. Housing unit observations with no corresponding person-level data were vacant and thus were excluded. Each person-level observation was then tested for eligibility defined by an age of at least 18 and English language speaking ability of "well" or better. Housing units were dropped if no household member residing there was both 18 years of age or older and spoke English at least "well." The total number of eligible households in 2013 was 112,983,091.

2013 ACS 1-Year Estimates were used to determine the number of households on Federal American Indian Reservations (AIRs) and trust lands held by the Federal government. According to ACS Table S1101 (Households and Families), the total number of households in these areas in 2013 was 335,953.

The 2013 2013 ACS 1-Year Estimates do not include information on State AIRs. Therefore, ACS 5-Year Estimates were used to determine the number of households on State AIRs and trust lands held by States. As shown in ACS Table S1101 (Households and Families), the total number of households in these areas in 2013 was 436.

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2 The housing and population data files are available from the US Census Bureau FTP site at http://www2.census.gov/acs2013_1yr/pums/csv_hus.zip and http://www2.census.gov/acs2013_1yr/pums/csv_pus.zip, respectively.

3 See ACS 2013 1-year estimates PUMS documentation for variable definitions and descriptions at http://www.census.gov/acs/www/Downloads/data_documentation/pums/DataDict/PUMSDataDict13.pdf.

Thus, the total number households in 2013 in both Federal and State American Indian Reservations and trust lands held by the State and Federal government was 336,389. This figure is for all 50 states in the United States.

Since the 2013 ACS data on households in AIRs is not available by state, it could not be used to calculate the number of households in AIRs in the lower 48 states (i.e. all states excluding Alaska and Hawaii).

Instead, the 2013 total for all 50 states was adjusted to reflect only those households that are within the lower 48 states using data available from the 2010 Census. The procedure used to do this was the following. Data from the 2010 U.S. Census were used to calculate the proportion of households on AIRs and trust lands that were in the lower 48 states.[4] In Hawaii, the state holds lands in trust for Native Hawaiians, so there are no AIRs. The lands held in trust are designated as Hawaiian home lands (HHLs) and do not fall into the category of trust lands held by States. In Alaska, lands reserved for Native Alaskans are categorized as Alaska Native Village Statistical Areas (ANVSAs). There is only one AIR in Alaska (Annette Island Reserve), which had 509 households according to the 2010 U.S. Census. Thus, according to the 2010 U.S. Census, the total number of households in Alaska and Hawaii in both AIRs and lands held in trust was 509 in 2010. For all 50 states, the total number of households in both AIRs and trust lands was 333,460 in 2010. Thus, the percentage of households in AIRs and lands held in trust that were in Alaska and Hawaii was 0.15 percent (509 / 333,460).

This figure was used to adjust the result obtained from the 2013 ACS datasets. The total of 336,389 households in AIRs and lands held in trust, within all 50 states, was multiplied by 99.85 percent, to estimate the number of such households in the lower 48 states. This resulted in an estimate of 335,876 households on AIRs and lands held in trust outside of Hawaii and Alaska.[5]

11.2.2 CALCULATION OF HOUSEHOLDS USED IN AGGREGATION

The total number of households over which damages are aggregated is 112,647,215 (the total number of households in the 48 states plus the District of Columbia, or 112,983,091 households, less the estimated number of households in AIRs and lands held in trust in those areas, or 335,876).

11.3 POPULATION ESTIMATE OF THE LEWBEL-WATANABE LOWER BOUND MEAN WILLINGNESS TO PAY

Since observed samples sometimes differ from the populations from which they are drawn, it is standard survey research practice to develop and use sample weights when calculating population level estimates. The weights compensate for differences in selection probabilities, for the effects of nonresponse, and for chance fluctuations from population figures. Consequently, the sample weights discussed in Appendix 1.14 are employed here in estimating the population mean willingness to pay (MWTP).

For respondents voting on a program to prevent the injuries laid out in Version A, the lower bound estimate of MWTP was $136.11 (Table 1). For respondents voting on a

4 2010 SF-1 Dataset, accessed at http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml.

5 Numbers may not sum due to rounding.

program to prevent the injuries laid out in Version B, the lower bound estimate of MWTP was $153.01 (Table 2).[6]

TABLE 1. LEWBEL-WATANABE LOWER BOUND WILLINGNESS TO PAY ESTIMATE VERSION A

Lewbel-Watanabe Lower Bound Mean WTP	Standard Error	t	P-value	95% confidence interval	
136.11	6.34	21.46	0.000	123.61	148.61

TABLE 2. LEWBEL-WATANABE LOWER BOUND WILLINGNESS TO PAY ESTIMATE VERSION B

Lewbel-Watanabe Lower Bound Mean WTP	Standard Error	t	P-value	95% confidence interval	
153.01	6.87	22.27	0.000	139.47	166.55

11.4 AGGREGATE ESTIMATE OF LOST TOTAL VALUE (A&B)

The calculation of total economic loss is conducted by multiplying the population lower bound MWTP by the appropriate number of households.

For Version A the point estimate of economic losses is $15,332,412,434 (112,647,215 households multiplied by $136.11). For Version B, the point estimate of economic losses is $17,236,150,367 (112,647,215 households multiplied by $153.01).

[5] A test of the equality of weighted MWTP results in a p value of 0.057. As documented in Technical Memo TM-10, the appropriate test of scope is conducted using unweighted data and rejects the hypothesis of equality in MWTP.